

**What is claimed is:**

1. A method for use in a stored program controlled system comprising a plurality of processing units and a central hub for interconnecting processing units using space division multiplexing over a free space optical beam line, said method  
5 including the steps of:

generating a collimated beamline at one of said plurality of processing units for a destination processing unit comprising another one of said plurality of processing units;

modulating a message on said collimated beamline;  
10 transmitting said beam through a volume of said free space beamline;  
receiving said beam at said hub; and  
demodulating said beam to recover said message.

2. A method in accordance with claim 1 further including the step of arranging said volumes in a helix around the circumference of said beamline.

3. A method in accordance with claim 1 further including the step of arranging said hub comprises arranging a plurality of transmit probes and a plurality of receive probes in an array.  
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4. A method in accordance with claim 1 further including the step of routing said messages at said hub.

5. A method in accordance with claim 1 further including a receive probe at a selected processing unit, said method further including the steps of:  
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modulating a message on said collimated beamline at said hub;  
transmitting said beam through a reserved volume of said free space beamline;  
receiving said beam at said selected processing unit and  
25 demodulating said beam to recover said message.

6. A method in accordance with claim 1 wherein each of said processing units includes a movable probe ring, said method further including the step of arranging said transmit and receive probes of a processing unit on said movable probe ring.

7. A method in accordance with claim 5 wherein said processing units include  
30 an actuator connected to said movable probe ring, said method further including the step of aligning said probes by said actuator to provide control over beam alignment.

8. An apparatus for use in a stored program controlled system comprising a plurality of processing units for interconnecting processing units to provide space division multiplexing over a free space optical beam line, said apparatus comprising:

5 a transmit probe configured to modulate a message on a collimated beamline and to transmit said beam through a volume of said free space beamline;

a receive probe configured to receive said collimated beamline in said volume of said free space beamline and to demodulate said collimated beamline to recover said message.

10 9. An apparatus in accordance with claim 8 wherein said volumes are arranged in a helix around the circumference of said beamline.

10. An apparatus in accordance with claim 8 further including a central hub comprising a plurality of transmit probes and a plurality of receive probes in an array.

11. An apparatus in accordance with claim 8 further including a router at said central hub configured to route messages.

15 12. An apparatus in accordance with claim 8 wherein each of said processing units includes a movable probe ring to align said transmit and receive probes of a processing unit.

20 13. An apparatus in accordance with claim 12 wherein said processing units include an actuator connected to said movable probe ring configured to align said probes to provide control over transmit and receive probe alignment.

14. An apparatus in accordance with claim 12 wherein said actuator includes stepper motors with lead screws.

15. An apparatus in accordance with claim 12 wherein said actuator comprises servomotors.

25 16. An apparatus in accordance with claim 12 wherein said actuator comprises a piezoelectric actuator.

17. An apparatus in accordance with claim 12 wherein said actuator comprises manual adjusters.

30 18. An apparatus in accordance with claim 8 wherein said receive probes include quadrant photodetectors.